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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/960,575	09/24/2001	Shinichi Imai	0819-0651	7295

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EXAMINER	
MAGEE, THOMAS J	

ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 06/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/960,575	IMAI, SHINICHI	
	Examiner	Art Unit	
	Thomas J. Magee	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

P riod for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 April 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disp sition of Claims

4)☒ Claim(s) *1-4,6 and 17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *3,4 and 6* is/are allowed.

6)☒ Claim(s) *1,2 and 17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Cancellations

1. Applicant's cancellation of Claim 16 in Letter of April 19, 2004 is acknowledged.

Claim Rejections – 35 U.S.C. 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claim 1 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.
The limitation, "*a ratio (S/L) of a sum of exposed areas S of the of the electrode pad in the contact holes, with respect to a total sum of lengths L of the boundary line in an overlapping portion of the boundary line, between the active region and the isolating region with the lead conductive films, is adjusted such that a breakdown ratio of the capacitance insulating film is substantially 0,*" is not definitive, since there are no ranges of values recited for S and L, in the Specification. Without values being recited on parameters, it would be difficult for one to practice the invention described in the instant application.

Claim Rejections – 35 U.S.C. 103

4 The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US 5,691,556).

7. Regarding Claim 1, Saito et al. disclose (Col. 21, lines 26 – 42) an integrated circuit containing capacitors, where an active region and an isolating region (17) (See Figure 1) enclosing the active region with an insulating film (22) on the active region and a boundary in contact with the isolating region (17). An upper conducting plate (21) atop the insulating film spaced away from the isolating region is formed and an electrode pad (14) formed on the isolating region wherein a lead conductive film is provided over a part of the capacitance insulating film (22) and a part of the isolating film (17) for connecting the upper electrode (14) and the electrode pad, with an interlayer insulating film (above 21) containing contact holes (below 14) that penetrate to reach the electrode pad.

Sato et al. do not explicitly disclose that the electrode pad areas, S, and the lengths, L, of

conductive lines in the boundary regions are adjusted, such that for a value, r = (sum) S/ (sum) L, the breakdown ratio of the capacitance insulating film is 0. It would have been obvious to one of ordinary skill in the art at the time of the invention to perform routine experimentation to obtain optimization for values of S and L to obtain a device free of breakdown.

8. Regarding Claim 2, Saito et al. do not disclose a numerical value of 4 or less for the ratio, S/L. However, Saito et al. disclose that the electrode pad, 14, (Figure 2) overlays the lead conductive film in the lateral region (right hand side) and that the width, L, would be within the area (S) of the electrode pad to make electrical contact between the two. It would have been obvious to one of ordinary skill in the art at the time of the invention to adjust the width of the lead conductive film with respect to the electrode pad to obtain a contact free of fringing effects such that S/L < or = 4. Since these elements are repetitive in the circuit, the total can then be obtained by multiplying by the number of elements, n, in numerator and denominator, which then cancel.

9. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al., in view of Yu et al. (US 6,084,271).

10. Regarding Claim 17, Saito et al. disclose (Col. 21, lines 26 – 42) a semiconductor device containing a substrate (15), capacitors, where an active region and an isolating region (17) (See Figure 1) enclosing the active region are provided on a silicon layer (24) wherein, the isolation structure (17) buries (covers) an oxide film (16) after forming a shallow groove (under 17) in the semiconductor substrate (18) (Col. 9, lines 34 – 35) with an insulating film (22) on the active region with a boundary in contact with the isolating region (17). An upper conducting plate (21) atop the insulating film with a portion over the isolating region is electrically continuous and corresponds exactly with the electrically continuous pad, lead conductive film and upper electrode recited in the instant application. Further, Saito et al. discloses that an interlayer insulating film is formed over the substrate with contact holes penetrating the interlayer insulating film to reach the electrode pad with a capacitance insulating film having a larger thickness in the boundary portion than in other portion.

Saito et al. do not explicitly disclose that the increasing thickness in the boundary region will avoid breakdown of the capacitance insulating film, however, it would have been obvious to perform a series of experiments to optimize the thickness to avoid breakdown of the insulator film.

Further, Saito et al. do not disclose that the isolation structure is an STI structure. However, The use of STI is notoriously well known in the art and Yu et al. describe a procedure for forming these structures (Figures 7 – 10). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the procedures of Yu et al. in Saito et

al. to obtain an STI structure to eliminate "bird's beak" effect and near-edge thinning effects.

Allowed Subject Matter

11. Claims 3, 4, and 6 are allowed.

The prior art of record do not reasonably teach or suggest, either singularly or in combination, the limitation in Claim 3 of "*the active region in contact with the boundary portion includes a region containing impurities having an oxidation enhanced diffusion effect.*"

The prior art of record do not reasonably teach or suggest, either singularly or in combination, the limitation in Claims 4 and 6 of "*a total sum of exposed areas of the second active region in the second contact holes is smaller than a total sum of exposed areas of the electrode pad in the first contact holes.*"

Response to Arguments

12. Applicant's arguments in regard to claims have been fully considered but they are not persuasive. In particular, issues regarding the quantities, S and L, remain not totally resolved. A new objection based on amended claim 1 was made, as described in the Office Action. Additionally, remaining arguments are moot in terms of the new ground(s) of rejection.

Conclusions

13. Any inquiry concerning this communication or earlier communications from the

Examiner should be directed to **Thomas Magee**, whose telephone number is **(571) 272 1658.** The Examiner can normally be reached on Monday through Friday from 8:30AM to 5:00PM (EST). If attempts to reach the Examiner by telephone are unsuccessful, the examiner's supervisor, **Eddie Lee**, can be reached on **(571) 272-1732.** The fax number for the organization where this application or proceeding is assigned is **(703) 872-9306.**

Thomas Magee
June 23, 2004

EDDIE LEE
SUPERVISORY PATENT EXAMINER
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